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PARKS

AN INTERNATIONAL JOURNAL FOR MANAGERS OF NATIONAL PARKS, HISTORIC SITES, AND OTHER PROTECTED AREAS

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Front Cover: Mount Sagarmatha, "Mother of the Universe" and heart of Nepal's new national park for the world's highest mountain. Photo: D. L. Golobitsh Back Cover: Part of the Buddhist Mani Rimdu festival at Thyangboche Monastery on the route to Mt. Everest from Namche Bazaar. Photo: D. L. Golobitsh

PARKS Magazine is an international publication for the exchange of information on the planning, use and management of the world's national parks and other protected natural and cultural resources.

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P. H. C. Lucas

Nepal's Park for the Highest Mountain

The highest mountain in the world is Nepal's incomparable Sagarmatha, "Mother of the Universe," an overpowering presence in a region of major natural and cultural significance.

Since it was first seen by western eyes in 1852, and no doubt for centuries before that, Sagarmatha, or Mount Everest as it is also known, has been accorded a special status. Gautama Buddha himself was born almost in its shadow, and over the years the great peak has inspired and fascinated millions.

It has also been an unconquered challenge to many a keen mountaineer, rebuffing all attempts until its massive 29,028 feet (8848 m) succumbed to Sir Edmund Hilary and Sherpa Tensing on May 29, 1953. But, in the words of Author Tukehida Kazami, 'you do not have to climb a mountain in Nepal to experience the beauty of the country. There is something indescribably delightful in just wandering around the countryside, the great mountains towering above you.' Ranging from the sub-tropical forests of the Terai to the great peaks of the Himalayas in the north, Nepal, with a land area of only 54,300 square miles (140,637 km^2) and a population of 11.5 million can boast some of the most spectacular natural areas in Southern Asia, with a variety of flora and fauna almost unparalleled elsewhere in the region.

Throughout the world, national parks have served for over a century to preserve and protect for the benefit and enjoyment of mankind examples of the world's most outstanding natural areas and wildlife. Many of these areas are, of course, major attractions to both local and international tourism. The concept of national parks has been adopted with enthusiasm by His Majesty, King Birendra Bir Bikram Shah Deva of Nepal, while their establishment as a conservation policy and as a means of stimulating tourism, an industry of growing economic importance to Nepal, was facilitated by the passing of Nepal's 'National Parks and Wildlife Conservation Act, 2029'.

First National Park

Several years ago the FAO and UNDP in co-operation with the Government of Nepal set up the National Parks and Wildlife Conservation Office (NPWCO) in the country's capital of Kathmandu. This Office was responsible for drafting the legislation and also the identification of several park projects.

Royal Chitawan National Park in the lowlands of the Terai, essentially a park established to conserve indigenous wildlife—including the dwindling populations of tiger and rhinoceros—was the first park officially constituted in Nepal. Development commenced about 1973.

Proposals in the NPWCO for a national park and other conservation measures in the Khumbu region, including Mount Everest, had been developing for some time. Arguments advanced in justifying the establishment of a national park in this area were (Blower 1972):

"1. As the highest point of Earth's surface, Mt. Everest and its surroundings are of major significance not only to Nepal but to the whole world, and its status as a National Park would bring

In this sweeping view—with Prem Kumar, a park game scout shown resting on the trail—one can see Sagarmatha (Everest) at the extreme left, Lhotse, and Ama Dablam. Photo: D.L. Golobitsh

international prestige and support to the country.

"2. Khumbu is already an important tourist area and its importance does not show any signs of decline. The scenic and wilderness values which are its major attractions must be protected from further exploitation and ill-judged commercial development. This can only be safeguarded through positive management based on sound conservation principles.

"3. The depleting forests of Khumbu are not only of aesthetic value but are vital for the people of Khumbu as a source of fuel and building material. They also play an important role in conservation of soil and water, and harbor much of the wildlife.

"4. As an ecological unit in the highest region of the world, the Dudh Kosi drainage is of much scientific value and offers unique research fields to scientists throughout the world.

"5. The area is of major religious and cultural significance in Nepal since it abounds in holy places like the Thyangboche monastery and also is the homeland of the Sherpas whose way of life is unique compared to other high altitude dwellers."

The region of the park

The Khumbu lies in the lap of the Himalayas. It is situated in the North Eastern region of Nepal in the Solu-Khumbu District of the Sagarmatha Zone.

Essentially, the Khumbu encompasses the upper catchment of the Dudh Kosi river system and is bounded on the north by the international border with the Tibetan region of the People's Republic of China. The Dudh Kosi catchment, which is roughly fan-shaped, is enclosed to the north by the massifs of Everest and Cho Oyu with their subsidiary peaks and glaciers and to the east and west by lesser ranges rising to 6,000 or 7,000 m and extending roughly at right angles to the main divide. It thus forms a distinct geographical unit enclosed on all sides by high mountain ranges. The Park covers an area of approximately 1243 km² (500 sq. miles).

Broken by deep and rocky gorges with majestic peaks rising, often in isolation, above the surrounding country, and with the fascination of a people who have established a way of life in a beautiful but often harsh environment, the Khumbu region must rank as one of the most attractive and interesting anywhere to visit, especially as its complete absence of roads is in marked contrast with more developed areas of the world.

Apart from the scenic values of the area, the Khumbu supports vegetation and animal life which add to the justification for establishing a national park. The blue pine *(Pinus excelsa)*, fir *(Abies spectabilis)* and fir-juniper *(Juniperus recurva)* forests between 2,800 m and 3,900 m give way to birch-rhododendron woods *(Betula utilis, Rhododendron campanulatum* and *R. campylocarpum)* which are found mostly between 3,600 m and 4,200 m. Between 4,000 m and 4,700 m the dominant vegetation is juniper-rhododendron scrub (*Juniperus wallichiana, Rhododendron anthopogon* and *R. lepidotum*). The highest limit reached by a rhododendron (*Rhododendron nivale*) is about 5,200 m. Above this, small scrubby plant communities are found to an altitude of about 6,000 m.

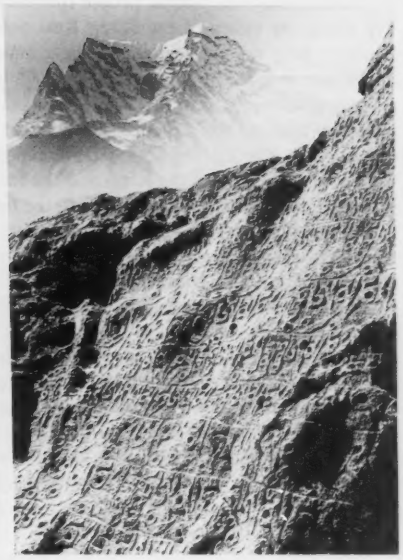
The mammal population of the Khumbu is very low and this is attributed directly to the activities of man in changing the forest habitat. However, wild mammals known to be present are the snow leopard, black bear, red panda, wolf, weasels and martens, Himalayan mouse hare, Himalayan tahr, blue sheep, goral, serow, musk deer and langur.

In contrast, the Khumbu is relatively rich in bird life including the blood pheasant, ruddy sheldrake, white-capped redstart, Himalayan dipper, Himalayan ruby-throat, snow pigeon, tufted pochard, jungle crow, red and yellow-billed choughs, and lammergeier.

Nepal envisaged potential economic benefits in establishing Sagarmatha (Mt. Everest) National Park and there is no doubt that this status rightly identified the region as one of the great scenic areas of the world and further enhanced its attraction as a tourist destination. The decision, in principle, in 1973 to establish the park was announced by the King's brother, His Royal Highness Prince Gyanendra, at the World Congress of the World Wildlife Fund in Bonn in October 1973. The Park was officially gazetted in July 1976.

Bilateral aid

Over recent years there has been growing interest among other countries in the national parks and reserves system developed in New Zealand, as well as in the country's potential to provide experts to assist in park projects, including training of park personnel. This



Above, rock carvings of the Sherpa-Buddhist mantra, or prayer, "Om Mani Pame Hom." The language is Tibetan. This carving, at Namche Bazaar, is thought to be 50 to 100 years old. Such carvings are still being made. Above left, park Warden Udipaya Sharma and Gordon Nicholls in the newly built park center at Namche Bazaar. Below, roof construction, Thyangboche guard post. Photos: D. L. Golobitsh

is in line with the New Zealand Government's external aid policy.

New Zealand's experience in mountain land management and His Majesty's Government's past favorable experience with New Zealand aid no doubt were among the factors which led to an approach to the Government of New Zealand for bilateral aid to establish Sagarmatha National Park. The New Zealand Government responded initially by sending to Nepal in May 1974 a three-man appraisal mission led by the author, then Director of National Parks and Reserves for New Zealand and a member of IUCN's International Commission on National Parks. N. D. Hardie, a leading mountaineer with considerable Himalayan experience and a member of the Arthur's Pass National Park Board and R. A. C. Hodder, Environment Forester with the New Zealand Forest Service, were the other members of the New Zealand Mission. They were assisted greatly by Hemanta R. Mishra of Nepal and Melvin Boulton of the NPWCO. Together they inspected all the major areas proposed for inclusion in the park and available to the public, covering some 193 km on foot and visiting Thamè, Gokyo, the Everest Base Camp (approx 5400 m) and Chukhung. The outcome was a series of recommendations to the two Governments, one of which related to the sending of a New Zealand expert to serve as project manager to help plan Sagarmatha National Park and associated conservation programmes inside and outside the park and also to supervise the establishment of prototype facilities in an attempt to solve the developing conservation problems.

Environmental deterioration

The aesthetic and scientific reasons for using the national park concept to protect scenery and natural plant and animal life hold good in the Khumbu. But perhaps the greatest justification for the park was the vital social and economic need to call a halt to the environmental deterioration that was occurring.

Tourism is a major industry and an important foreign exchange earner for Nepal as well as one of the main sources of Sherpa income. Since a policy of facilitating tourism was adopted by His Majesty's Government, the number of foreign tourists visiting the Khumbu has increased from 20 in 1964 to about 4000 a year at present. Although relatively small, this number is significant because the park is a 12-day walk from a road.

Traditionally the Sherpa people (population about 3000), who live along the valley of the Dudh Kosi and its tributaries in the Khumbu have practised forest conservation but this unfortunately has lapsed in the face of growing pressures from an increased flow of immigrants and refugees with their yaks and sheep, and an increased demand for structural timber and fuel-wood because of tourism, trekking and mountaineering expeditions. The result has been overgrazing of alpine scrub and the forest floor as well as of grassland and also serious inroads into the limited timber resources in an area of high altitude and low productivity.

Overgrazing has led to heavy depletion of the vegetation in many areas leaving a remnant cover less capable of holding the soil. Early stages of erosion are much in evidence, the result not only of overgrazing but also of forest depletion.

Increasing numbers of visitors of all kinds were certainly bringing economic benefit to the people of the Khumbu but their impact on the natural resources and the tourist routes, where there were virtually no sanitation and rubbish disposal facilities, was also sowing the seeds of environmental and economic disaster. However, the establishment of the Khumbu area of Nepal as a national park meeting international criteria, with environmental safeguards established in the park and the adjoining environmental buffer zone, is expected to save the area from further modification of the vegetation and the various pollution and erosion problems.

New Zealand project manager

Co-operation between New Zealand and His Majesty's Government of Nepal in the field of nature conservation and preservation was agreed to with an overall aid program of $NZ 300,000 for a five year period being established. Gordon Nicholls, formerly Supervisor of National Parks with the New Zealand National Parks Authority, was appointed Project Manager and left New Zealand in May 1975 on a two-year assignment to work with the Nepalese Government on the establishment of the park.

One of Gordon Nicholls' early involvements was to commence building a park centre on a knoll above Namche Bazaar, the last 'big' town before Everest Base Camp. Construction is in the natural stone of the region and the site has commanding views of the valley below the Khumbu region, Everest and other peaks. Bruce Jefferies has succeeded Gordon Nicholls, and with his Nepali counterpart is concentrating on establishing an effective park administration.

For visitors to the park, an accommodation and camping complex has been built. Located at Thyangboche, the complex comprises an accommodation lodge, camping facilities, kitchen water supply, toilets and rubbish disposal amenities.

As the complex is in intimate contact with the park environment, landscaping will ensure that the visual impact blends pleasantly with the Himalayan background.

In many ways very encouraging support is being received from the Sherpa community. The tree replanting program is under way in and around the villages in the park buffer zone. Young trees planted during the last two years have survived well. The result of these conservation efforts will, it is hoped, go a long way towards ensuring that the approach to the park is as inviting as possible.

Significant progress has been made on the legislative and administrative aspects of the park's establishment. Boundary definitions have been decided while a draft management plan is being prepared and park regulations (by-laws) which will apply to all Nepalese mountain national parks have practically reached finality and will be published shortly.

Associated with New Zealand's park project efforts in Nepal itself is the training in New Zealand of young Sherpa men from the Khumbu. Training in both the practical and administrative aspects of park-management is given. These trainees on return will become the administrators and wardens of the park that preserves and protects the natural environment of the highest mountain in the world—to the Nepali, Sagarmatha, 'Mother of the Universe'.

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Peter H. Bennett

Operational Guidelines for the World Heritage Convention

Late this year those nations which have ratified the Convention for the Protection of the World's Cultural and Natural Heritage—34 when this article was written—will begin submitting their nominations of areas proposed for world recognition as natural or cultural areas of outstanding universal value.

To reach this point almost two years of intense international work has been required in a broad effort highlighted by the first meeting of the World Heritage Committee in June 1977. This first meeting of the Convention's governing body, held at UNESCO in Paris, was encouraging, constructive and fruitful, producing rules of procedure, a budget for the first year's work, and Operational Guidelines—all adopted unanimously. Political considerations virtually never intruded, probably due at least in part to a clause in the convention which specifies that the 15 Member States elected to the Committee must be represented by experts in the fields of cultural and natural conservation.

The Operational Guidelines are of special importance: they will constitute the basis of the decisions regarding the implementation of the Convention which will have to be taken by all future Committees. They will of course be modified and added to as experience is gained at successive meetings. These Guidelines comprise the following main elements:

- Criteria for inclusion of cultural sites to the World Heritage List
- Criteria for inclusion of natural sites to the World Heritage List
- Format and content of nominations for the World Heritage List
- Annual Timetable for receipt of nominations
- Method of Establishing List of World Heritage in Danger
- Format and content of requests for international assistance
- List of organizations to be invited as observers to future Committee meetings

Before deciding upon the criteria for the inclusion of properties on the World Heritage List, the committee agreed on certain basic principles. The criteria themselves must enable the Committee to act with full independence in evaluating solely the intrinsic merit of the property and not its suitability for assistance by the World Heritage Fund. There must be two separate sets of criteria, one for cultural and one for natural properties. Properties shall be included on the List according to a gradual process and no formal limit will be imposed, either on the total number of properties to be included on the list, or on the number of properties any individual State can submit at successive stages for inclusion on the List. If a property included on the List has deteriorated to such an extent that it has lost those characteristics for which it was included or when further research has shown that the property is no longer, in fact, of outstanding universal value, that property shall be deleted from the List.

It was decided that all property included on the World Heritage List shall be identified by a plaque, in a location which does not visually impair the property in question. It will contain a World Heritage Emblem (to be designed through UNESCO), the name of the property and a statement as to why it merits inclusion on the List. Finally, the Convention is not intended to provide for the protection of all properties of great interest everywhere, but only for a select list of the most outstanding of those from an international viewpoint. The Committee also agreed that in the case of the word "universal" in the key phrase "of outstanding universal value", opinions as to the significance of a property may vary from one culture or period to another and the word "universal" shall therefore be interpreted as referring to a property which is highly representative of the culture of which it forms part.

The first drafts of the criteria themselves were prepared by IUCN on the natural side and ICOMOS and the Rome Center on the cultural side. They were amended considerably by the Committee and in their final form are of sufficient importance to be quoted in full. They are probably as clear and comprehensive as can be expected and should provide a sound basis for the evaluation of both cultural and natural nominations.

Only those nations which have ratified or otherwise adhered to the Convention will have the opportunity to submit their priceless natural and cultural areas for global recognition as part of the World Heritage. To date, 34 states have taken this essential action. Photo: Clare Ralston

The following numbered paragraphs are quoted from the document entitled "Operational Guidelines for the World Heritage Committee" which was adopted at the Paris meeting:

Criteria for the inclusion of cultural properties on the World Heritage List

9. Outstanding universal value will be recognized when a cultural property, as defined in Article 1,* submitted for inclusion in the World Heritage List is found to meet one or more of the following criteria. Therefore each property should:

(i) represent a *unique artistic* or *aesthetic* achievement, as a masterpiece of the human creative spirit;

(ii) be of *outstanding importance* owing to its influence, over a span of time or within a cultural area of the world, on subsequent developments in architecture, monumental sculpture, garden and landscape design, or human settlements;

(iii) be *unique, extremely rare* or of *great antiquity*;

(iv) be among the *most characteristic* examples of a type of structure, the type representing an important cultural, social, artistic, technological or industrial development;

(v) be a *characteristic example of a significant* traditional style of architecture, method of construction, or human settlement, that is fragile by nature or has become vulnerable under the impact of irreversible socio-cultural or economic change;

(vi) be *most importantly* associated with ideas or beliefs, with events or with persons, of outstanding historical importance or significance.

10. (a) In every case, consideration should be given to the state of preservation of the property (which should be evaluated relatively, that is, in relation to property dating from the same period and of the same type and category).

(b) In addition, the property should meet the test of *authenticity* in design, materials, workmanship, and setting; authenticity does not limit consideration to original form and structure but includes all subsequent modifications and additions, over the course of time, which in themselves possess artistic or historical values.

Criteria for the inclusion of natural properties in the World Heritage List

11. Outstanding universal value will be recognized when a natural heritage property as defined in Article 2*, submitted for inclusion in the World Heritage List is found to meet one or more of the following criteria. Therefore properties should:

(i) be outstanding examples representing the *major stages of the earth's evolutionary history*. This would include sites which represent the major "eras" of geological history such as "the age of reptiles" where the development of the planet's natural diversity can well be demonstrated and as the "ice age" where early man and his environment underwent major changes;

development, this focuses upon on-going processes in the development of communities of plants and animals, landforms and marine and fresh water bodies. They would include, for example, a) as geological processes, glaciation and volcanism, b) as biological evolution, biomes such as tropical rainforests, deserts and tundra, c) as interaction between man and his natural environment, terraced agricultural landscapes.

(ii) be outstanding examples representing significant on-going *geological processes, biological evolution and man's interaction with his natural environment*. As distinct from the periods of the earth's

(iii) contain *unique, rare or superlative natural phenomena, formations or features or areas of exceptional natural beauty*, such as superlative examples of the most important ecosystems to man, natural features (rivers, mountains, waterfalls), spectacles presented by great concentrations of animals, sweeping vistas covered by natural vegetation and exceptional combinations of natural and cultural elements,

(iv) *be habitats where populations of rare or endangered species of plants and animals still survive*. This would include those areas where concentrations of plants and animals of universal interest and significance are found.

It should be realized that individual sites may not possess the most spectacular or outstanding single example of the above, but when the sites are viewed in a broader perspective with a complex of many surrounding features of significance, the entire area may qualify to demonstrate an array of features of global significance.

12. In addition to the above criteria, the sites should also meet the conditions of *integrity*.

(i) the areas described in 11. (i) should contain all or most of the key interrelated and interdependent elements in their natural relationships; for example, an "ice age" area would be expected to include the snow field, the glacier itself and samples of cutting patterns, deposition and colonization (striations, moraines, pioneer stages of plant succession, etc.),

(ii) the areas described in 11. (ii) should have sufficient size and contain the necessary elements to demonstrate the key aspects of the process and to be self-perpetuating. For example, an area of "tropical rain forest" may be expected to include some variation in elevation above sea level, changes in topography and soil types, river banks or oxbow lakes, to demonstrate the diversity and complexity of the systems,

(iii) the areas described in 11. (iii) should contain those ecosystem components required for the continuity of the species or of the objects to be conserved. This will vary according to individual cases; for example, the protected area for a waterfall would include all, or as much as possible, of the supporting upstream watershed; or a coral reef area would be provided with control over siltation or pollution through the stream flow or ocean currents which provide its nutrients,

(iv) the areas described in 11. (iv) should be of sufficient size and contain the necessary habitat requirements for the survival of the species.

The Guidelines then specify in detail the format and content of the nominations for inclusion on the World Heritage List and the accompanying documentation needed. The information required is under five main headings for each property: specific location; juridical status; identification (including description, maps, photographs or films, history and bibliography); state of preservation and conservation; and justification for inclusion on the World Heritage List.

On this first occasion, nominating forms and accompanying instructions will be in all Member States' hands by November 1, 1977 and nominations must be sent back to UNESCO by April 1, 1978. Nominations will be quickly screened by UNESCO for completeness of documentation; they will then be sent to IUCN and

* of the Convention. See PARKS Vol. 1, No. 1, page 12, for language defining the Cultural Heritage and the Natural Heritage.

List of States having deposited an instrument of ratification or acceptance; date of deposit of ratification (R), acceptance (Ac) or accession (A)

Algeria	24. 6.74	(R)
Australia	22. 8.74	(R)
Bolivia	4.10.76	(R)
Brazil	1. 9.77	(Ac)
Bulgaria	7. 3.74	(Ac)
Canada	23. 7.76	(Ac)
Costa Rica	23. 8.77	(R)
Cyprus	14. 8.75	(Ac)
Ecuador	16. 6.75	(Ac)
Egypt (Arab Republic of)	7. 2.74	(R)
Ethiopia	6. 7.77	(R)
France	27. 6.75	(Ac)
Germany (Federal Republic of)	23. 8.76	(R)
Ghana	4. 7.75	(R)
Guyana	20. 6.77	(Ac)
Iran	26. 2.75	(Ac)
Iraq	5. 3.74	(Ac)
Jordan (Hashemite Kingdom of)	5. 5.75	(R)
Mali	5. 4.77	(Ac)
Morocco	28.10.75	(R)
Niger	23.12.74	(Ac)
Nigeria	23.10.74	(R)
Norway	12. 5.77	(R)
Pakistan	23. 7.76	(R)
Poland	29. 6.76	(R)
Senegal	13. 2.76	(R)
Sudan	6. 6.74	(R)
Switzerland	17. 9.75	(R)
Syrian Arab Republic	13. 8.74	(Ac)
Tunisia	10. 3.75	(Ac)
United Republic of Tanzania	2. 8.77	(R)
United States of America	7.12.73	(R)
Yugoslavia	26. 5.75	(R)
Zaire	23. 9.74	(R)

ICOMOS for evaluation against the natural and cultural criteria respectively and a recommendation as to whether they qualify or not. They will then be considered by the World Heritage Committee at its next meeting, to be held in the United States in late 1978. At that meeting the Committee will also consider in what form the World Heritage List should be published and how the existence of the List can effectively be publicized.

It should be noted that the World Heritage List may at first appear to be incomplete and to lack some world-famous properties which would seem obvious choices for the List. This is because the Convention states clearly that only those properties in the territories of Member States of UNESCO which have ratified the Convention can be nominated to the World Heritage List, and that only those Member States can apply for assistance from the World Heritage Fund. There is good reason for this provision: when all the Member States of UNESCO adopted the Convention in 1972, they felt that only those States adhering to the Convention and paying their specified contribution to the World Heritage Fund should be entitled to the benefits flowing from the Convention. Nominations to the List will therefore be an annual, on-going process. States as they adhere will start to make nominations and other States which have adhered for some time will be making additional nominations as they identify and evaluate further properties which seem to meet the criteria. From time to time the Committee may also be making deletions from the List if changing circumstances warrant.

The Guidelines also deal with the method of requesting assistance from the World Heritage Fund and the information required for this purpose; the procedures to be followed by the Committee in considering such requests; the order of priorities for giving financial aid; the type of agreement to be concluded between the World Heritage Committee and a State receiving assistance under the Convention; and the international organizations that shall be invited to send observers to future meetings of the Committee.

Finally, the Guidelines made some interesting recommendations: that when setting the boundary of a property to be nominated to the List, the concept of a buffer zone around the property should be applied where appropriate and feasible; that in order to ensure efficient carrying out on a property of conservation measures requiring aid from the World Heritage Fund, a single body (whether international, national, regional, local, public or private) should be entrusted with the responsibility of carrying out the project; and that where possible Member States should include in their nominations properties which combine in a significant way cultural and natural features of outstanding universal value.

There is a tourism implication for all countries having properties on the List which may in the future need careful watching. The fact that a property is on the World Heritage List will undoubtedly over the long term result in greatly increased tourist visitation, local and international, to that property. If the property is fragile, for ecological or other reasons, care will have to be taken to ensure that the values which put it onto the List in the first place are not dangerously eroded.

So a significant start has at last been made in the important and mammoth task of identifying, protecting, preserving and presenting the most outstanding elements of the world's cultural and natural heritage. The task is a daunting one and the financial resources available are at the moment pitifully low. But as the World Heritage Committee gets on with its work and is seen to be doing an effective job, and as the World Heritage List and the List of World Heritage in Danger become better known, this situation should improve. There can be no more worthwhile challenge than an endeavour to protect for future generations those properties anywhere, whether cultural or natural, which are of outstanding universal value and therefore part of the world's heritage.

Peter H. Bennett is Coordinator of Liaison and Consultation for Parks Canada, and the Canadian representative on the World Heritage Committee. He served as Rapporteur for the first meeting of the Committee, results of which are described in this article.

Harold Kristian Eidsvik

The Park Planning Process

There are as many approaches to park planning as there are planners. Because the resources and the relationships to the populations they serve are never the same, each park presents a unique situation. Two factors are critical to achieving a suitable plan. These are, first, a systematic approach, and second, sound judgments based on the testing of alternatives. This article outlines one approach.

A park may be based on marine resources, on land resources or on historic or cultural resources, or a combination of these resources. Each park is unique in its character and flavor. Except in the formulation of the planning team, to include experts in the special disciplines involved, the planning process does not vary greatly. Whether the park is a nature sanctuary or a recreation area, the process remains basically the same.

A park may be large such as Zaire's Virunga (800,000 ha) or it may be small such as Port-Cros in France (685 ha), but the planning process does not vary significantly.

Closely related to the planning process is the management process. Through management, ideally, guidelines are provided outlining legislation, policies and objectives which are the terms of reference with which the planning process begins. The management guidelines may lead the planner in different directions for each park, but they do not change the process except in relation to the amount of public participation which may be desired. The planning involvement decreases with the submission of the plan and its alternatives to management for decisions. As a part of the management process, the evaluation and refinement of plans should be assigned to a planning officer to ensure the continuity of the plan and the dynamism of the process.

The process of planning can be summarized as follows:

> "The process of preparing, in advance of action and in a reasonable systematic fashion, recommendations for policies and courses of action (with careful attention to their probable by-products, side effects or spill-over effect) to achieve accepted objectives" (Woodbury 1966).

The components of this definition describe a methodology which should permeate all planning, be it for a single park or for a park system.

Management guidelines for planning

The management process guides and controls the planning process. In turn, management is guided and controlled by legislation. Policies flow from legislation and are generally approved if not developed by management. Consistent with the policies, the objectives of individual units of the park system should be identified.

In the planning of a park, the planner should, where possible, review the legislation, policies and objectives spelled out by management as well as the specific guidelines he may receive. The understanding of these fundamental or basic elements will aid the development of plans which will become more than plans—they will become realities.

Specific legislative requirements or restraints will generally be clarified in guidelines. Suffice it to say at this time, a quick review of legislation will help the planner to understand the *raison d'être* of the park in which he is involved.

There is no international uniformity of legislation as it relates to national parks and protected areas. The legislative approach in Britain places a great responsibility on local governments and agencies to manage park lands through zoning by local councils. In the United States, each national park has its own unique identity in an Act of Congress. In Canada, one federal statute governs all national parks. In Australia, each state has its own legislation. In brief, when planning a park, begin with the legislation.

A park policy is a statement by a government or an organization setting out the general principles it will apply to the management of its parks. It is often not written; it is often not available in one document; it is, however, a generally accepted way of doing business. Policy does not always have the binding force of legislation. A governing organization may say, for example, that it will adhere to IUCN or CNPPA criteria and standards. It is not legally bound to do so; however, because it is an IUCN member, the organization has elected to do so. In planning a park, the planning team must ensure that it has a clear understanding of organizational policies.

Continuing from the general to the specific, policies are followed by objectives. Specific objectives may be spelled out for a park just as they may be spelled out for an organization.

Some of the reasons for setting objectives are to provide direction, to aid coordination, to stimulate action and to provide measures for management control. Briefly, objectives are a tool to improve the planning and the decision-making process.

In *Man & Nature in the National Parks*, Darling and Eichorn said:

> "...The only absolute administrative principle (for national parks) can be to consider first the ecological health of a park so that it shall endure for posterity" (Darling & Eichorn, 1967).

If we look at this for a moment as an objective, the main thrust is a concern for the ecological health of a park. This gives us a basis against which planning proposals can be tested.

The relevant factors to include in considering the physical and ecological character of a park include:

1. Size
2. Physiography, soil, geology
3. Water
4. Vegetative covering
5. Animal Life
6. Management and maintenance practices (Mattyasorsky 1974).

When is a park ecologically healthy? When is this state of health impaired? These are difficult questions which do not have standard replies. Each park and each ecosystem within a park must be individually evaluated. There are guidelines:

1. The living organisms and their environments are inseparable and interdependent (e.g., wildlife and habitat).
2. The interaction between the elements and their environments leads to an exchange of material between the living and the non-living parts.

Legislation often establishes the basic overall objectives for an area, and these must be used to guide the park planner. Here at Cape Hatteras National Seashore (USA) Congress sought to preserve the shoreline and its natural values and at the same time to provide for water-oriented recreation.

This definition meets the criteria previously outlined and can be readily broken down into sub-objectives.

Achieving objectives in planning, then, must commence with a framework within which *the plan* becomes a part of the *means* of achieving an *organizational objective*.

Simply stated, the objective provides the planner and all others involved in the program with direction.

Park planning: dynamic, interdependent and continuous

The provision of an unbiased, comprehensive and interdisciplinary approach to the long-run solution of problems, with due concern to the action to be taken and the reaction which will occur, is the basic planning responsibility:

> "The steps in the planning process are interdependent. That is, the planning process is a circle of interdependence incorporating feedback and feed forward between the steps.
> "Feedback permits the planner to correct for future action in light of past experience. Feedback is inherent in all steps where actions are reviewed, amended or discarded" (Uleck).

Another important element of the planning process, also described by Uleck, is "replanning"; it is a continuous process of valuation and re-valuation based on changing natural and/or social economic circumstances. The process is dynamic in that it is continuous and requires periodic review of plans every few years (i.e., 5 to 10).

Planning is also an interdisciplinary process. In this respect, Dansereau summarized the situation as follows:

> "The problems of natural resources utilization can neither be posed nor solved by one discipline alone. Therefore an efficient understanding of them awaits a better communication between the natural scientist and the emergence of a larger number of men capable of encompassing both aspects (social and natural sciences) and of acting upon this improved knowledge" (Dansereau 1957).

The role of management in the planning of a park is to first recognize that a plan is needed. This need may be identified during the budgetary process. It is often at this point that questions are raised relating to the purpose of specific projects and their interrelationship to other projects. In developing a park there is an interdependence between all components. If the relationships are not clear, an inadequacy or lack of a plan may be indicated.

The planner responsible for a park must have guidelines to assist him in his planning. These guidelines should spell out the basic purpose of the park (its theme) as well as its secondary purposes. The guideline might also provide details on the time available for the planning project as well as personnel available. In addition, particular restraints should be described. Examples of restraints might be that no boundary changes will be considered, or that consultation with regional planning authorities must be carried out, or maximum and minimum budget levels; the need to adhere to existing policies could be confirmed or amended, if desired.

In preparing guidelines, management should review objectives for the park. Objectives should be reaffirmed where they are clear or, alternatively, the planning team should be requested to reassess objectives and submit revisions for approval as an early phase of the planning process.

The planner has a responsibility to identify objectives, to weigh the costs as well as the benefits of various alternatives, and then to recommend the course of action which seems to be the best way of achieving the objectives.

The following planning process relates closely to that of Uleck; it involves approximately 25 steps under four major headings. Each major heading will be discussed in detail on the following pages.

PLANNING PROCESS AND CHECKLIST

I. Management Responsibility
- Legislation
- Policy
- Objectives
- Guidelines

II. Resource Specialist Responsibility
- ***Natural Resource Inventory and Analysis***
- Climate
- Physical Resources
- Vegetation
- Wildlife
- Water and Wetlands
- Cultural Resources
- Planimetric and Topographic Details
- ***Socio-Economic Inventory and Analysis***
- Legal Structure of Region
- Government Authority
- Community Structure
- Population Characteristics
- Educational Levels
- Recreational Activities
- Social Organizations
- Land Ownership and Use
- Transportation Systems
- Tourism Activities

III. Planning Team Responsibilities
- ***Data Analysis***
- Natural Resources
  - Rarity
  - Representativeness
  - Ecological Importance
  - Scientific Importance
  - Visitor Interest
  - Recreational Capability
- Socio-Economic
  - Impact of Park on Local Population
  - Impact of Local Population on the Park
  - Impact of Park on Region, Nation, etc.
  - Projections of Visitor Use
  - Public Participation
  - Information and Communication
  - Infrastructure—Utilities, Access
- ***Data Synthesis***
- Review Objectives and Guidelines
- Determine Boundary Alternatives
- Test Zoning Alternatives
- Relate to Visitor Use Facilities
- Relate to Administration and Management Requirements
- Review Access and Circulation Systems
- Evaluate Impact on Environment of Alternatives
- Recommend Range of Alternatives for Public Participation
- Prepare Planning Documents for Approval

IV. Management Responsibilities
- Review and Evaluate Proposals
- Provide Written Direction Related to Approval and Funding
- Identify Responsibility for Execution
- Initiate Re-Evaluation Process

I. The Role of Management

Legislation, Policy, Objectives

1. Awareness of Need
2. Summarize Existing Situation
3. Prepare Management Guidelines
4. Establish and Evaluate Objectives
5. Test Proposal Through Outside Participation

The initial responsibility of management is to recognize a need, to assess the situation and to recommend a course of action.

The provision of guidelines for the planner is a management responsibility. The statement should be framed in relation to the realities and the restraints, such as capital and manpower, which are forecast for the future. Dr. Coleman Woodbury (Woodbury 1963) has suggested that the omission of capital programming in the planning process is simply the adult equivalent of writing letters to Santa Claus—if cost is ignored, planning is just so much wastepaper.

In addition to providing guidelines, management may wish to test the proposal by presenting it to an advisory board, to elected officials, to public organizations, or perhaps, through a public participation program, to a wider audience.

II. The Role of Resource Specialists

Inventory, Analysis, Research

1. Assemble Socio-Economic Data
2. Assemble Resource Data (Natural and Cultural)
3. Assemble Base Data Relating to Relevant Regional Development
4. Analyze Available Data in Relation to Needs
5. Outline Additional Data Needs
6. Initiate Program to Obtain Essential Data.

The collection of background data through field studies and the evaluation of existing maps, plans, surveys, visitor use studies and economic reports is an essential beginning point for the planner. The work may be carried out by specialists in a variety of professions or, in the situation where resources are limited, by an individual.

In addition to assembling data on the proposed park, it is essential to consider the region surrounding the park and its interrelationships in a present and future sense.

The information should be thoroughly analyzed and evaluated. It should then be summarized to present an overview to be incorporated in the planning document.

The resource specialists would also at this time outline future research requirements as well as areas requiring more intensive inventory. Through this process the data bank expands and provides more precision for future revisions of planning documents. In addition to providing for planning purposes, the data base is essential to the development of management plans and interpretive or information programs for the park management team.

William Mott, the former Director of California's Department of Recreation and Parks, described the process as follows:

> "Today we must do environmental planning. What does that mean? It means that we have to look at all of the resources within an area to be planned, and make an inventory of those resources. We have to use the technical skills and knowledge of not just landscape architects but architects, engineers and planners, plus the skills and knowledge of archeologists, historians, environmentalists, foresters, botanists, etc., each contributing to the planning process so that the total environment and the relationship of its parts are fully recognized and taken into consideration in the plan.

"In addition, the planning process must include use of the skills and knowledge of psychologists, sociologists and cultural anthropologists. The social scientist can be of great help in planning parks for people. Today, if we're going to do a total planning job so that parks will be relevant to today's needs, we must utilize the ability and knowledge of planners as well as the knowledge of people from the natural and social science disciplines." (Mott 1965)

III. The Role of the Planning Team

Analysis, Synthesis, Alternatives

1. Analyze Available Data
2. Outline Scope of Problem
3. Evaluate Trends—Futures
4. Outline Alternative Proposals
5. Test Proposals Through Outside Participation
6. Prepare Provisional Plan
7. Present Provisional Plan for Management Approval
8. Prepare Master Plan or Sectorial Plans
9. Present Plan for Public Review
10. Prepare Revisions as Necessary

The person in charge of the planning team is primarily a coordinator, a communicator and a facilitator. It is his responsibility to pull together a diversity of opinion and factual data to create a whole out of myriad parts.

The evaluation process is an analytical process in which the planner must critically assess the data available. He must discover weaknesses as well as strengths. To do this he must pull things apart and examine the pieces.

Once the information available has been analyzed, it may be necessary to search out additional background data and to repeat the process.

The creative portion of the planning process begins with problem definition. Knowing the information available as well as the management objectives, the planner must now begin to synthesize or bring together all of the components to create a new whole. The component data must be assessed in relation to their potential roles in a new management situation. This evaluation must be exercised in relation to current situations as well as future trends.

A Canadian periodical describes the process of analysis and synthesis as follows:

"Synthesis, putting things together, calls for the mental skill we call creative thinking. It is much different from analysis and therefore from analytical thought. Analytical thinkers are typically critical rather than creative. They enjoy pulling things apart or even tearing them down. Creative people are builders. They like to 'get it all together'.

"Creative thinking is a process for putting things together. It is synthesis. The invention of the airplane put together the glider, the internal combustion engine, and the propeller. All of the elements already existed. The new pattern was first put together in thought. Then it was transformed subsequently into a reality. Thus, through synthesis, the world obtains its new things.

"It is not too much to describe synthesis as the magic which holds the universe together. In synthesis, the whole becomes greater than and different from the mere sum of the constituent." (*Insights* 1976)

In preparing park plans, one is in reality taking a great number of existing facilities or landscape characteristics and developing a new relationship between them to facilitate their use and/or preservation by man.

Alternatives must be developed and tested through exposure within the organization; it is desirable, as well, to search out a broad range of external opinion. In simple terms, the least costly time to initiate change is during the planning process. The evaluation of alternatives at an early stage is perhaps the best method to ensure the implementation of the best alternative.

Mt. Tarumai in Shikotsu-Toya National Park, Japan's "museum of volcanoes" in western Hokkaido, is part of a carefully protected natural area. Planning processes for an area such as this are basic and can be followed in planning a seashore, historic area, or any kind of park.

In developing the "park concept", the planner is primarily concerned with how the native qualities of the landscape can best be presented in relation to human needs and in harmony with the stated policies of the agency. On the basis of the available data he must determine the type of park development which would complement the landscape and be in harmony with the overall character of the area. Developments which would be incongruous in a wilderness might be highly compatible and, in fact, desirable in other types of parks. The park concept is not a fixed or pre-determined notion but is an expression of the park character. Its validity is dependent on the planner's knowledge of the park and is subject to revision as that knowledge expands and crystalizes.

"Perhaps the planning process can best be explained as a series of subconscious conversations which the planner has with himself—the question posed, the factors weighed, and then the recorded conclusion. The more lucid the thinking, the more coherent the powers of idea communication . . . the better is the plan." (Simonds 1961)

Various terms such as preliminary master plan, provisional plan, conceptual plan, etc., have been used over the years to describe planning documents. In brief, they all express the fact that planning is a continuous process in which initial plans are presented in revised forms under new titles.

Current planning policy in the United States suggests that the term master plan implies an unrealistic degree of permanence and that the term "management plan", which is a composite of resource plans, interpretive plans, operational plans, etc., is perhaps a more accurate description of both the process and the end result. The document resulting from the process of planning a single park is a synthesis of a number of sub-plans. Formerly this document was called a master plan.

As a comment on this brief review of the planning process, it is suggested that its greatest weakness rests in the presentation and approval process. Planners are often imbued with the idea of major change; the process leads them in this direction. The net result is often the production of idealistic schemes which are often not attainable within budgetary or management restraints. In essence, a great number of managers are not preconditioned to think in 10-, 15- or 20-year terms. This suggests that long-term plans should be developed in component phases which can be achieved within budgetary time periods, and which do not require management to

make major long-term decisions in the terms of current knowledge. In essence, planners should seek only approval in principle of long-range concepts. The components which lead toward the concept through a series of development programs should be "self-contained" and approved within a five-year financial plan.

IV. The Continuing Role of Management

Evaluation, Approval, Establishment and Re-Evaluation

1. Evaluate Plan and Provide Written Approvals and Modifications
2. Identify Responsibility for Execution
3. Establish the Park
4. Initiate Plan Re-Evaluation

The planning process begins with the management role; it also ends with it. In brief, management must foster the planning process, it must make decisions approving, rejecting or modifying plans, and it must re-initiate the process through continuous evaluation.

To reiterate, the planning of a park must be viewed as a part of a broad process:

> According to John Owen, "few of the world's parks are large enough to be, in fact, self regulatory ecological units; rather most are ecological islands subject to direct or indirect modification by activities and conditions in the surrounding areas." (Owen 1972)

Circumstances within and surrounding parks frequently change with time; it is, therefore, essential that the planning process be dynamic, involving constant re-assessment of initial proposals or plans.

Public participation in the planning process is becoming more and more vital to the achievement of objectives. A followup article addressing the question of public participation will appear in a future edition of PARKS.

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Marion Glaspey

The Stone Harbor Bird Sanctuary

The largest heronry on the east coast of North America above the Carolinas is a sanctuary owned and protected by the Borough of Stone Harbor, a southern New Jersey resort town on a barrier island between the ocean and a wide band of tidal marshlands.

The sanctuary is a veritable showcase of most North American species of herons and egrets, with an estimated population of ten thousand birds at the height of the nesting season. Nowhere in the world can one see so many heron species in such numbers and at such close range. American, snowy and African cattle egrets, little blue and Louisiana herons, black-crowned and yellow-crowned night herons, and the glossy ibis all nest here. To round out the picture, great blue and little green herons are occasionally seen in the sanctuary although they nest elsewhere, and the white ibis has been an infrequent late summer visitor.

When the feather trade was in full swing back at the turn of the century, herons and egrets completely disappeared from this traditional nesting place and it was not until the late 1930's that they began to reappear. At that time the sight of a single heron in a summer was a rare treat. During the next decade the rookery flourished and in 1947 the Stone Harbor Borough Council approved an ordinance establishing the twenty-one acre nesting area as a sanctuary. In 1965 it was given national status as a Registered Natural Landmark.

This sanctuary, because of its easy accessibility, has become world-known among nature lovers and photographers, and visitors exceed 125,000 yearly. A semicircular parking and observation area for the convenience of visitors looks out over a wet meadow ringed with marsh alder and elderberry where the fledglings congregate to feed until they are strong enough to leave the sanctuary. Beyond this is an old dune area with a few venerable hollies and junipers

and a lush tangle of younger growth composed of the same species plus wild cherry, shadblow, alder and sassafras smothered with Virginia creeper and wild grape. Here, in the trees and shrubs and even on the dune itself, the multitude of birds stake out individual territories and construct nests. From mid-March when they arrive from the south until October weather sends them back to warmer climes, the show is constant and varied. Coin operated binoculars are provided in the observation area for those who wish an even closer view, and, to aid in identification, a display case holds information and examples—carved in relief—of each of the nesting species.

Several platforms have been placed near the back of the open viewing area where sticks and vines cut into suitable lengths are brought from outside and piled to augment the hotly contested supply of nesting materials. This serves the two-fold purpose of aiding the birds and bringing more of the action out into public view.

April, when the birds are in full nuptial plumage and engaged in courtship displays and nest building, is an ideal time for photographing. For visitors just wishing to see the birds, prime times at any season are shortly before sunset when they are returning from the marshes for the night, or at dawn when flock upon flock of herons rise up through the trees and fly out over the heads of enthralled spectators.

Behind the barrier island lie extensive salt marshes, a rich source of food for the herons as well as many other kinds of birds. Some five thousand acres of tidal marsh in southern New Jersey were purchased for preservation by the World Wildlife Fund in 1969 and have since been acquired by the State as part of its Green Acres Program. Besides feeding the herons, supplying the nutrients to support the many and diverse components of marine food webs, providing spawning and nursery grounds for fish and shellfish and serving other valuable functions, these marshes and embayments are also a haven for migrating shorebirds and wintering waterfowl. Thousands of brant winter in the back bays, along with black ducks, scaup, buffleheads, old squaws and others. The sanctuary itself, with its lush vegetation, provides year-round shelter for many birds other than herons. More than two hundred different species have been seen in or passing over the sanctuary.

As noted earlier, The Stone Harbor Sanctuary is a Registered Natural Landmark, under a program of the US Department of the Interior which is operated by the National Park Service. The registry is designed to recognize and encourage the preservation and protection of selected natural sites irrespective of administration or ownership. Participation in the program is on a voluntary basis and the areas do not become federal property. Official designation as a Registered Natural Landmark is conditional upon the acceptance by the owners of the bronze plaque and certificate.

Marion Glaspey is president of The Wetlands Institute, P.O. Box 91, Stone Harbor, New Jersey 08247/USA, a non-profit research and educational facility presently administered by Lehigh University and devoted to ecological concerns. All photos are by the author.

Top, snowy egrets feeding in a part of the extensive wetlands near Stone Harbor. Left, visitors come by the thousands to watch the birds. These are glossy ibis in flight as seen from the observation area. Above, the plaque awarded to the Borough of Stone Harbor. All photos: Marion Glaspey

Mario F. Broggi

Nature Conservation and Landscape Management in Liechtenstein

Liechtenstein, with a surface area of 160 sq. km and approximately 24,000 inhabitants, is a dwarf state in the heart of central Europe, between Switzerland and Austria. Apart from the narrow Rhine valley plain, the landscape in Liechtenstein has a pronounced mountainous character. Over a short distance, mountain ridges over 2000 m in height tower over the Rhine valley plain. In spite of the small size of the country, the diversity both in geology and topography has produced an astonishing variety of flora and fauna. For instance, over a distance of only 4 km as the crow flies can be found a unique reed flora with the marsh gladiolus *(Gladiolius palustris),* the Siberian iris *(Iris sibirica)* and also an Alpine snow valley flora with the glacier buttercup *(Ranunculus glacialis).*

Liechtenstein as a country is burdened by three historic afflictions: the former floodings of the Rhine, the *Föhn,* a stormy south wind which dries out the soil and helps to spread outbreaks of fire, and torrents, known as *Rüfen* (lit. landslides), which, particularly after heavy thunderstorms, eat away steep slopes that are subject to erosion.

Only with the implementation of a far-sighted forestry planning policy of the year 1865, entailing definite aims for forest conservation, were the first important steps taken against the further degradation of the landscape. This forestry planning was followed in 1867 by a law for the improvement of the Alpine economy, in 1872 by a *Rüfen* law containing measures against erosion, and in 1899 by a forest preserve law. Thus the first legal preconditions were laid down for the preservation of the landscape surface.

The first nature conservation regulations with the force of law applied, in 1903, only to the protection of Alpine flora. A Liechtenstein nature conservation law came into force in 1933, which, in its main provisions, is still valid today. This law expresses the principle of conservation obtaining at that time and is designed to afford more protection to such remarkable "natural formations" as waterfalls, geological structures, habitats of rare plants and the like. At that time this was doubtless a very modern nature conservation law, but in the next 20 years it scarcely made any impact. Crises and wars brought in their train worries and troubles of a more obvious kind. It was only at the beginning of the 1950's that the concept of nature conservation attracted general attention. The catalyzing factor was the onset of mass tourism in the Malbun valley. In 1952 this valley was declared a plant protection area, and since then, the Warden Service of the Alpine Club has been responsible for the enforcement of the regulations. The first nature reserve was created in 1961 when an area of reeds, about 45 hectares in extent, was placed under protection. Since then, five further reserves have been established in the valley area. The various societies, founded in the meantime, have provided important stimuli for the cause of nature conservation. These include the five ornithological associations, the Society for the Protection of Animals, the Game Protection Society, the Botanical-Zoological Society of Liechtenstein-Sargans-Werdenberg and the Liechtenstein Society for Environmental Protection.

Because of its limited size, Liechtenstein cannot boast of any large nature reserves. Nevertheless, it possesses some habitats with singularly rare examples of central European fauna and, in particular, flora. Botanical research of the country, commissioned by the government, is proceeding apace, and a book on the flora of Liechtenstein is at the moment in the press.

The concept of nature conservation has undergone a change. The focal point is no longer the single natural phenomenon—the natural formation—but the landscape in its entirety as a basis of life and as an environment for mankind. Hence nature conservation, apart from its measures for conservation, must today increasingly resort to operational landscape design methods. The frequently used twin term, "nature conservation and landscape management", now firmly established in the wording of the new nature conservation law, clearly indicates the expansion of this sphere of activity. For today the main problems to be solved are those which have been caused by the progressive change in economic use of the landscape due to the increasing industrialization of the country.

In Liechtenstein, in particular, the change from agricultural state to industrial state has proceeded at a furious pace. Whereas in 1941, 34% of the working population were still engaged in agriculture, the figure today is only a bare 4%. To make up for this, the industrial export quota amounts to about SF 22.300 per head (1974).

Landscape in Liechtenstein. Photo: H. Wenzel

This rapid industrialization process has not failed to leave its mark on the landscape. In the valley, the sharp increase of low density settlements has led to a curtailment of the agricultural space, which is of course very limited for topographical reasons. On the steeper slopes and in the inner Alpine region, it is the growing extent of utilization for agriculture that is giving cause for concern.

Liechtenstein models for landscape management

Liechtenstein has produced its own landscape management models for its triad of landscapes, the Rhine valley plain, the area between the foot of the slopes and the Rhine valley watershed, and the inner Alpine region.

The vision of natural meadows with the wild Alpine Rhine flowing through them is now a thing of the distant past. The arable land was with great difficulty wrung from the river, whose bed has now been laid between high dikes. Large sections of the coppices in the fields and the woods in the meadows had been felled, mostly during the two world wars. High winds had led to further devastation in the now denuded landscape.

In 1944, in view of this situation, the government of the Principality, "in its struggle against the worsening of the climatic conditions", placed under legal protection all trees and shrubs in the northern part of the Rhine valley, i.e., in the actual agricultural area. Since 1949, lines of windbreaks have been systematically planted. Whereas, initially, considerations of wind protection were almost the only deciding factor, research has meanwhile provided fresh knowledge on the importance of these windbreaks for ecology and landscape management. Between 1968 and 1973 planting projects were drafted for all valley villages in Liechtenstein. These projects covered not only suggestions for the planting of coppices on agricultural land but also of groups of trees in the open country.

In the past 25 years over 1 million trees and shrubs have been planted. Thus gradually the valley area is being turned into a park-like landscape which has a land requirement of only about 3–4% of the total area and which is in no way a hindrance to the healthy development of the villages.

The barren hay meadows on the mountainside facing the Rhine valley are scarcely used any more, as progressive mechanization of agriculture sets limits to the cultivation of these steep slopes, a task which was less difficult when performed by manual labour. Visible signs of this evolution away from manual farming are overgrown forest glades, hay sheds falling into ruins and, above all, new evidence of erosion in the mountain area. We are now left with an extremely unstable ecological balance, which has led to damage, partly unexpected, to the resultant fallow land. This damage appears to be caused mainly by the following phenomenon. As the hay meadows are no longer used, the long grass remains standing in the winter. On the slopes this grass, with the help of the influx of the warm *Föhn* winds, gets frozen in the snow cover. Then, with the onset of creeping snow, the vegetation cover is stripped off. Thus dangerous scars are left in the soil, which, as potential causes of erosion, will be enlarged by subsequent heavy rainfall. Severely weathered limestone also adds to these processes of degradation.

Damage by erosion on former agricultural land. Photo: M.F. Broggi

The areas urgently in need of redevelopment have now been registered and subjected to overall forest development planning. Likewise a beneficial division in the landscape between forest and farmland has been laid down, after taking into consideration the interests of all types of land use. A bonus is paid for cultivating the open areas of countryside which are to be conserved. Those areas to be afforested for protective reasons are being redeveloped and afforested by public funds in order of priority. The draft of the new nature conservation and landscape management law envisages, in addition, a general obligation to cultivate all land that can be used for agriculture.

The Principality has undertaken a major task in the inner Alpine region. It is intended that original vegetation should be restored to wide sections of this region. This Alpine region is threatened on all sides by the lack of protective forests, by very extensive grazing and by the heavy increase in tourism. Bold and radical measures must be taken. A government decree of 1 July, 1968 was directed at a co-ordination of all types of use of the landscape by means of an integral redevelopment of the mountain district. In any case, a clear distinction has been achieved between forest and pasture. The favourable and fertile soils have been allocated to the grazing area, where they are also being improved by fertilization and enclosed meadow cultivation. The steep slopes and other areas for which protection by woods is important are being afforested. All tourist facilities are restricted to one valley, where they are to be integrated to harmonize with the mountain landscape. In this way wide areas of natural landscape are being safeguarded. This aim is being achieved with the help of large government subsidies. The expenditure is justified because today we are concerned primarily with the interests of the public in keeping a mountain landscape intact. About 2% of the state budget is made available annually for this redevelopment programme. With this sum in the next few years Alpine roads will have to be built and extended, large scale afforestation taken in hand, pasture land improved, as well as expensive barriers erected as a protection against avalanches and torrents.

Liechtenstein is a small country and easily surveyable. For this reason there are opportunities for testing the possible solutions to many problems which occur in the Alpine region. In all three of the landscape management concepts, an attempt is being made to consider the landscape as a total, organic structure and thus grant it pride of place in the list of life's important fundamentals. The aim is not the conservation of a degraded landscape but the establishment of a functioning, stabilized landscape for the benefit of mankind.

This article, written by Mario F. Broggi, Liechtensteinische Gesellschaft für Umweltschutz, (Postfach 53290, 9490 Vaduz, Liechtenstein) originally appeared in the February 1977 issue of Natur-und Nationalparke, *the European Bulletin of the Federation of Nature and National Parks of Europe.*

PARK PRACTICE

Graffiti Removal and Protection

Theodore H. M. Prudon

In the last few decades, graffiti more and more have become a very serious problem. This wide-spread form of vandalism often appears as extensive and elaborate designs and writings, sometimes obscene, which are found on a variety of surfaces applied with a number of easily available paints or marking materials. Complete removal of these graffiti or protection against these vandals are virtually impossible.

Once the graffiti are made, their removal usually is extremely difficult. The relative effectiveness of removal depends upon the type of marker or paint used, the type of remover utilized and the type and condition of the masonry substrata to which the graffiti were applied. Masonry materials have substantially different porosities. Markings on very porous materials are especially difficult to remove because paint or ink have been absorbed into the surface. Graffiti removers can aggravate this condition by dispersing paints or inks and carrying them deeper into the material. For the denser masonry this problem is less likely to occur. Also, roughly textured surfaces pose problems in the effective removal of graffiti; but on the other hand minor residue will be less visible because of that same textured and varied appearance. A polished or smooth surface of a dense material such as granite, for instance, should offer relatively lesser problems because paint or ink may not be absorbed deeply. Even so, complete removal of the graffiti is not possible in most cases. Some pigments or stains usually remain, frequently as a shadow effect.

Selection of a graffiti removal method depends upon the type of paint or ink used. Water based paints or inks are found in some marking pens. More common are paints such as alkyds, varnishes, epoxy esters, acrylics or PVA latices, etc., which can be found either in liquid form or in a spray can, depending upon the type of paint. Occasionally lipstick is used as a marking material.

Standard masonry cleaning methods can sometimes be used to remove graffiti but generally they are too expensive and ineffective for localized cleaning. Water washing or high pressure water applied in combination with strong detergents might be effective in removing some types of paints and ink, particularly those that are water based. Once these cleaning techniques are applied, it might be better or necessary to clean a whole wall, in order that glaring "clean spots" are avoided. Not much additional cost is involved once material and equipment are on the site.

In the past sand or dry grit blasting occasionally has been used to remove graffiti, but there are serious objections to this method. The principle of the blasting process is to force under high pressure an abrasive grit against the surface. The grit has a scouring effect, taking part of the surface away, thereby, removing the graffiti if applied deeply enough. What remains is a severely pitted and abraded area that, with outside exposure, is likely to soil more quickly and to show other signs of deterioration in a short period of time. Also, if subsequent graffiti are applied in the same area, the effect will be worse for obvious reasons. Thus there is nothing to gain with a removal method of this sort, except perhaps in a very few special cases. Application on the whole wall, while eliminating the localized problems, ultimately might endanger the condition of the entire wall.

Most commercially available graffiti removers will be found to be effective only on one or two types of material. *A universally applicable remover does not appear to exist* and is not likely to be developed because of the completely different marking materials involved. Essentially, only a few

Classic graffiti application to concrete wall and ramp with a spray paint. In addition, surface of the concrete has been damaged. Removal of graffiti should not prove to be too difficult. Because of type of construction material and the exposure, application of a protective coating might be advisable. Photos: Theodore H. M. Prudon

different types of graffiti removers can be identified, these being paint removers, either solvent or alkali based, and detergents or some few combinations. These graffiti removers can come in various forms, as a liquid, powder, aerosol, gel or spray.

The alkali removers are the most common, and are based upon such chemicals as trisodium phosphate, caustic sodas or silicated alkalis. The alkalis affect the oil based binders of paints, setting them up as soaps which can be rinsed away with water. Their effectiveness is therefore limited primarily to use on oil based paints, which are not frequently used for graffiti. Moreover, the alkali removers have some drawbacks. If the alkaline solution is not washed away properly, the residue can develop efflorescence, that is, the formation of usually whitish crystal salt deposits on or just below the surface of the masonry. When the efflorescence is only on the surface, the salts can simply be brushed away. Do not use a metal brush.

The serious problems are generally posed by the more modern types of enamel, epoxy, acrylic or alkyd paints. For these coatings or paints, which usually will have been applied by brush or spray, removers are mostly solvent based. The solvents vary and their use may depend upon the type of paint encountered. Simple coatings and designs can probably be removed with a product containing nonchlorinated solvents. These are usually of relatively low cost and have solvents classified as "aromatic." The ingredients can also include benzene, toluene with methanol, and some ketone often added as co-solvents. The addition of thickeners and waxes to this mixture helps to hold the remover on the surface to be cleaned, and physically assists removal of the graffiti material.

Application of white paint and graffiti to rusticated masonry wall. Removal of the white paint should be relatively easy. If complete removal is not achieved, the residue will probably not be highly visible because of textured masonry surface. However, a "clean spot" will develop because the surrounding surface is heavily soiled.

Graffiti application to masonry. A test application has been made. The dirt has been removed from the masonry but the graffiti have remained visible. Improper remover was used. Complete cleaning of the surface will be necessary to achieve a homogeneous color.

Graffiti application on a textured masonry surface. Removal of the spray paint will prove difficult because of the porous nature of the sandstone. Residue of the white paint, however, will not be highly visible because of the light color of the original sandstone and the textured nature of the surface. Complete cleaning of the wall will be necessary to avoid "clean spots". Application of protective coating probably would be undesirable because of the high moisture content of the masonry. This would cause failure of the protective coating and possibly of part of the masonry.

More effective are the chlorinated hydrocarbon solvents, of which methylene chloride is one of the most efficient and the least toxic. Generally, however, because of their dangerous character, application must be made under very carefully controlled circumstances. A number of uncommon solvents are sometimes added to increase the effectiveness particularly on epoxy and similar paints.

The application of commercial graffiti removers is in itself quite simple. If possible, the kind of paint or ink used should be determined in order to select the proper and most effective remover. If it is not known what was used, graffiti removers of different compositions, including a strong detergent, should be tried on small areas. The remover is left to soak on the surface for a time, at least 5 to 10 minutes. When solvent based removers are used, caution is necessary. These solvents are highly volatile and flammable. Moreover, some removers, particularly the chlorinated hydrocarbons, are highly toxic and could damage skin on contact. Protection for hands and eyes is

TYPES OF PAINT AND MARKING MATERIALS

REMOVER	waterbased	oil based	epoxy ester	acrylic	alkyd	urethanes
alkaline paint remover	*	*				
water and strong detergent	*					
"aromatic" or non-chlorinated solvents	* (latex, etc.)					
chlorinated hydrocarbons solvents			*	* note 2	*	
nitric acid solvents			* note 1			
other solvents					* note 3	note 4

Note 1. Epoxy ester paints are extremely difficult to remove because of the toughness of the coating, verging sometimes on porcelain-like hardness. For removal, a solution of nitric acid in dimethyl sulfoxide is used at a temperature of 120° to 130°F. (48.8°-54.4°C). This is effective but can not be applied in the field.

Note 2. The chlorinated hydrocarbons are the most effective paint removers; if they fail, the more expensive dimethyl sulfoxide (see note 1) is used. The most common and the least toxic solvent is methylene chloride. Because of their toxic nature, use of chlorinated hydrocarbons sometimes encounters objections.

Note 3. The non-chlorinated solvents are effective in removing oleoresinous graffiti. They are based on solvent types usually referred to as "aromatic" and include benezene, toluene, with methanol and ketone added as co-solvents.

Note 4. The urethanes are resistant to both alkaline and acid materials and to most solvents. Usually the application of urethanes is a two component system making them unlikely as graffiti material.

essential. Upon completion and removal of the graffiti, the area is rinsed carefully with water. Steam cleaning is effective in removing chemical residues. It must be remembered that localized cleaning of this sort might cause undesirable "clean spots". As noted earlier, cleaning the masonry wall completely is the only method to alleviate this problem.

It is impossible to give any good and simple instructions as to how to determine what paint is used. The best and only good method, as noted earlier, is to use small quantities of different removers selected because of their different compositions, which should be noted on the label. Start with water and strong detergents, try some "aromatic" solvents or alkaline remover, and lastly, try one of the removers containing one of the strong solvents, or the solvent alone, with very great care.

Protective Coating

Because the incidence of graffiti usually cannot be prevented, and an area recently cleaned can be marked again overnight, methods for protection of the masonry surface have been explored. If a surface is relatively impervious and smooth in finish, one method of protection is the application of a clear coating in critical locations. Even if the graffiti affect the coating, the masonry itself would be intact and after removal a new coating can be applied.

Choice and application of coatings is, however, not without problems. Coatings themselves frequently are not desirable either because they aggravate existing conditions, or because they hasten deterioration of the masonry material itself, possibly causing spalling or cracking. If no such problems exist, the coating should be clear or transparent and permeable to allow for the evaporation of moisture.

Selection of the coating against graffiti is critical. Many masonry sealers are commercially available but are unsuitable for this particular purpose. Silicones, vinyls or polyurethanes are usually not adequate because of limited lifespans, discoloration as a result of exposure, or because they may become opaque.

Removal of graffiti from these coated masonry surfaces is relatively simple. Water with detergents and a stiff bristle brush (non metallic) can be effective. If this is unsuccessful an organic solvent such as mineral spirits can be applied. Markings that are harder to remove, such as the ones with alkyd paints, require stronger solvents such as xylol, toluol or ketones. These solvents may also remove some of the acrylic sealer system, making necessary a partial reapplication of the protective coating.

In summary, graffiti are made with a variety of marking substances, many of which are difficult or impossible to remove. To find effective restorative methods, some experimenting usually is necessary, especially if the type of paint or ink is unknown. Commercially available removers are not equally effective but are generally designed to remove the acrylic or epoxy paints.

On modern structures, particularly those with hard, smooth stone or masonry walls, protection against the damage of graffiti may be provided by coatings. Acrylic coating systems appear to have been the most successful but they themselves can have undesirable effects.

Whenever historic structures are involved, one should think twice before taking any action since there is always the risk of irreparable surface damage from improper or improperly used removers.

Application of graffiti is indeed vandalism, and surely it is as serious as outright breakage or physical impairment. Since removal is so difficult, important structures and surfaces subject to this form of attack might well be protected by physical barriers such as moats or grills. Designers of new structures should certainly bear this in mind when selecting materials for wall surfaces. In some cases, designers should consider deliberately making access to vulnerable surfaces very difficult or impossible to achieve.

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Use of Chemical Restraints in Handling Wildlife

Roy D. Hugie

Wild and semi-wild animals are captured for various reasons; scientific or management purposes such as putting on a radio collar or marking the animal, checking for the presence of or treating an illness or injury, and relocation. Capturing a wild or even tame animal risks the animal's life and health, the safety of the handlers, and the expenditure of money or loss of equipment. Before embarking on a project involving immobilization of animals, biologists and their administrators—preferably with the advice of a veterinarian—should evaluate alternative approaches and be certain that what is to be gained is worth the risks.

The purposes of this article are to review drugging and handling procedures used in wildlife management and to provide the names and addresses of manufacturers of drugs and equipment. A brief article like this can in no way do justice to the volume of literature available on the subject. Also, because the use of certain drugs and procedures varies greatly with each species, I have included references that outline specific procedures or dosages. Specialized equipment and material are needed to immobilize animals. I therefore have included the names and addresses of some of the companies providing such items. My omittance or inclusion of a supplier does not imply a rejection or endorsement by me or the Maine Department of Inland Fisheries and Wildlife. Many drugs are obtainable from several manufacturers or suppliers, therefore I have included the chemical as well as brand names of most drugs.

Capturing Animals

Animals can generally be immobilized only after one can get close to them. In the case of some game ranches and zoos, the animals may already be in cages or pens of various sizes. In the wild, however, the animals must be made approachable by first trapping, netting, stalking, or roping them. In some cases, a vehicle or some other means is used to get close to them. A review of how to capture various species is found in Taber and Cowan (1971).

Once the animal can be approached, there are two methods to restrain or immobilize it. For some tame, semi-tame or even wild animals, physical restraint usually involves few risks. Small and medium sized mammals, many birds, and even some large herbivores can be safely handled by using nets, squeeze cages, etc. Usually, however, physically restraining an animal involves risks to both handler and animal. People who work with animals also must realize that an animal can receive psychological as well as physical harm from being handled. Stress and injury from handling animals by physical restraint can ultimately lead to their deaths. Because many species are too large, too dangerous, or too easily stressed to permit physical restraint, chemical restraints (drugs) are often preferred as a means of immobilization.

Types of Drugs

The types of drugs most commonly referred to in wildlife literature can be classified as paralysing or centrally-acting. Paralysing drugs cause paralysis of voluntary muscles. Centrally-acting drugs act on the central nervous system and their effects include tranquilization, sedation, muscle relaxation, analgesia, and anaesthesia. Each drug works in a different manner and is better suited to some species than others. When selecting a drug the worker should evaluate the following characteristics (Ditman, 1964)—knowing that no drug can fulfill them all for all species: 1) a large margin of safety; 2) similar dosages for most species; 3) quick acting but not so quickly as to cause injury; 4) recovery without an antidote or artificial resuscitation, yet have an antidote available that works quickly and is easily administered, if needed; 5) no deleterious effects on debilitated, starved, or dehydrated animals; 6) predictable and recognizable effects both going into and coming out of the drugged condition; and 7) the volume needed should not be excessive (<20 cc). Other factors that might also be important include the cost per dosage, availability; government restrictions or regulations, storage requirements, and safety to the handler. I have included specific information on only a few of the most common drugs. References cited will provide a means of getting more information on many additional drugs. Additionally, good sources for information are regional veterinarian supply companies.

Succinylcholine Chloride

Succinylcholine chloride (SCC) is a paralyzing drug and at one time was used extensively for capturing wildlife. Trade names include Anetine (Burroughs, Wellcome & Co., Ltd., London, UK) and Succostrin (Squibb & Sons, Princeton, New Jersey 08540 USA). It is inexpensive, readily available, comes in liquid or powder forms (premeasured disposable darts: Pneu-Dart, Inc., P.O. Box 388. Williamsport, Pennsylvania 17701 USA), water soluble, and fast acting. Its disadvantages include a narrow margin of safety for most species, strictly an immobilizer, not an anesthetic (animal feels pain), not a tranquilizer (animal senses what is going on), has no antidote, a short time of immobilization and cannot be given in multiple doses. A slight underdose does not immobilize the animal while a slight overdose will kill it, usually through respiratory paralysis. Artificial respiration can often be given successfully if breathing stops for small and medium sized animals. Centrally-acting drugs are now available for most of the situations and species where SCC was used in the past. SCC has no place in immobilization of endangered species.

Because the dosage rate of SCC varies greatly with each species and even with the condition and sex of each individual, it is more appropriate here to give references on the use of SCC rather than specific examples. Taber and Cowan (1969) review intramuscular dosages of SCC for various

Wild animals are immobilized for a number of reasons. Biological research is a frequent one. Here a radio collar is affixed to an immobilized black bear. Photo: Roy Hugie

Special syringes are loaded with the proper drug in the precise dosage for the animal to be immobilized. Photo: Fred Hurley

groups of species. Harthoorn (1965) discusses the use of SCC for *Hippopotamus sp.* Buechner et al. (1960) discuss using SCC on Uganda kob *(Adenota kob thomasi).* Talbot and Lamprey (1961) evaluate SCC use on several East African ungulates. Several authors have described the effect and use of SCC on North American ungulates such as moose *(Alces alces)* and caribou *(Rangifer tarandus)* Bergerud et al., (1964), wapiti *(Cervus canadensis)* Flook et al., (1962), and mule deer *(Odocoileus hemionus)* Pearson et al., (1963).

Phencyclidine Hydrochloride

Another popular drug that has been used on many species is phencyclidine hydrochloride (PH) or Sernylan (Parke-Davis & Co., Detroit, Michigan, 48232 USA). This drug produces a cataleptic (fixed muscles) state and, when used in large doses, or in conjunction with tranquilizers or narcotics, it also produces an anaesthetic state. PH is relatively slow acting (12 to 25 minutes), long lasting (1 to 5 hours or more), inexpensive, has a wide margin of safety, and is readily available although sale is carefully controlled. It's main disadvantages include possible violent muscular convulsions, overheating of the animal in hot climates, and long recovery periods (necessitates being watched and protected). Concentrations of the liquid drug come in 20, 50, and 100 mg per cc, thus reducing problems of volume for most species. Phencyclidine is most useful if used in conjunction with promazine hydrochloride (Sparine: Wyeth and Bros., Ltd., Havant, Hants, U.K.) which reduces convulsions and occasionally with atropine sulfate (Parke-Davis) to control excess salivation.

A review of the uses of PH in carnivores and other mammals by Seal and Erickson (1968) list dosages for several families (Table 1). Noteworthy is that PH has been used effectively on pregnant animals with no recorded deleterious effects. Used in combination with promazine hydrochloride, PH has proven to be useful and effective for a wide variety of animals. Phencyclidine hydrochloride is preferable to succinylcholine chloride in most species.

Ketamine Hydrochloride

Ketamine hydrochloride (Ketaset: Bristol Laboratories, Bristol-Myers Co., Syracuse, New York, 13200 USA) is similar to Sernylan in that it acts on the central nervous system. Ketamine has the following general characteristics: it has a very wide margin of safety, acts quickly (3 to 15 minutes), lasts about 45 to 75 minutes, secondary doses can easily and safely be given to extend immobilization, overdoses generally are not fatal, convulsions are less likely than with PH, and it is readily available. Coughing, swallowing, and respiration are not adversely affected. The main disadvantage with ketamine is that it is not very soluable so a large volume is needed for some species. Concentrations are available in 50 and 100 mg/cc. A recent innovation with ketamine is Ketaset-Plus (Bristol-Myers Co.) which has a tranquilizer (promazine) and anti-salivation substance already mixed with the 100 mg/cc concentration of ketamine hydrochloride. Ketamine is slightly more expensive than phencyclidine hydrochloride depending on the supplier. It is preferable to phencylidine in most cases and to succinylcholine chloride in nearly all cases.

Ketamine has been used effectively on procyonidae at 8-10 mg/kg (Bigler and Hoff, 1974), sheep at 20-40 mg/kg (Thurmon et al., 1973), canidae at 10-20 mg/kg (Humphrey, 1971), felidae at 10-15 mg/kg (Commons, 1970), ursidae at 10 mg/kg (Hugie et al., 1976) and primates at 6-13 mg/kg.

Ketamine is particularly well suited for handling medium and small animals safely and reliably. Its anaesthetic characteristics make it useful for treating wounds. Research on the use of ketamine for wildlife is still advancing, particularly with regard to its use in conjunction with other drugs. Ketamine is especially well suited for immobilizing felids in the 80 kg or less category. The disadvantage of not being able to inject enough drug to completely immobilize a large animal can be partially overcome by giving a 10 cc dose (1000 mg) with the dart gun and following with hand injections.

A drug similar to ketamine and phencyclydine is CI-744 (Tilazol: Parke-Davis). It is similar to ketamine in many respects but is very soluable and potent, thereby requiring only small volumes for most species. CI-744 is a combination of drugs using the analogue of phencyclydine and a tranquilizer (zolazepam). It is not thoroughly tested and is unavailable at present in most areas of the world. When it becomes widely available and tested it may prove superior to both phencyclidine and ketamine.

Xylazine

Xylazine has the trade name of Rompun (Bayer AG, Leverkusen, Germany) and is one of the most promising drugs for wildlife workers. Xylazine has a multiple action in that it affects the central nervous system, acts as a muscle relaxant, and analgesic. Xylazine is available in liquid or dry form. Xylazine may cause slight muscle tremors, reduced respiration, bloating in ruminants, effects which can last up to 4 or 5 hours. Animals immobilized or sedated may move in response to sharp noises. An advantage of xylazine is that an animal can be given a dosage that will produce a state of sedation, immobilization, or anaesthesia, depending on the amount. Xylazine has been used effectively on many species of animals but is particularly well suited for some ruminants

TABLE 1. DOSAGES AND EFFECTS FOR SEVERAL ANIMAL FAMILIES WITH PHENCYCLINE HYDROCHLORIDE AND PROMAZINE HYDROCHLORIDE.[1]

Family	Animals	Trials	Species	Dosage Range	Preferred	Comments
Ursidae	68	229	7	0.7-2.0[2]	0.8	No fatalities
Canidae	52	74	14	0.8-2.0	1.0	Salivation evident[3]
Procyonidae	69	140	7	0.7-1.2	1.0	Effective, Safe
Mustelidae	51	77	17	0.7-1.2	1.0	Effective, Safe
Felidae	83	126	19	0.7-1.5	0.8-1.0	Effective, Safe
Hyaenidae	13	32	3	0.7-1.5	0.8	Some Salivation
Viverridae	26	40	12	0.7-2.0	1.0	Relaxed
Pinnipedia	4	7	4	Not Given		1 Death[4]
Ungulates	29	44	9	0.5-3.0	1.2	Docile
Cattle	-	-	-	0.6-0.7	0.6	Partly mobile
White-tailed deer	-	-	-	0.7-10.0	4-8	Variable results
Primates	47	61	16	0.5-2.0	1.0	Recumbent

[1]From Seal and Erickson (1968)

[2]Dosages are in mg/kg and refer to the amount needed of each drug (Sernylyn and Sparine)

[3]Atropine sulfate will lessen salivation

[4]Resulted from pooling of blood; avoid by maintaining the animal on level surface and turning periodically. Disassociative anaesthetics are not recommended for Pinnipedia

and members of canidae. Bauditz (1972) reviewed the use of the drug on a wide variety of captive and free-living animals. Ratti and Zeeb (1972) discussed the practical aspects of using xylazine in the immobilization of game. Free-ranging animals generally require higher dosages of xylazine than captive or domestic animals. When handling ruminants with xylazine (and most other drugs) it is important to keep the drugged animals on their sternums. An animal's digestion tract should be as empty as possible before drugging because immobilization always affects the process of digestion (Ratti and Zeeb, 1972). Table 2 includes some examples of dosages of xylazine for several representative species. Specific literature should be consulted when using all drugs but particularly with xylazine since the effects desired vary with dosage and species.

Other Drugs

Harthoorn (1965) should be reviewed by those considering using any of the centrally-acting morphine derivatives such as etrophine hydrochloride (M-99: Reckitt & Sons, Ltd., Dansom Lane, Hull, England). M-99 and its antagonists (counteracting substances) have proven very useful and effective for many species. The problems with its use, e.g., infections, sterility, kidney malfunction, etc., often are not apparent until days or weeks after the animal has walked or run off (Pienaar, 1968). Government restrictions or regulations often make the use of narcotics cumbersome or prohibitive in some countries. It is advisible to investigate what regulations are required before deciding to use narcotic drugs. It must be noted that M-99 is dangerous to handle. It can be absorbed through the skin with serious effects. Included in Harthoorn's monograph (1965) is an excellent review of the general problems, approaches, and related information regarding the use of drugs and handling wild animals in general.

Pienaar (1968) states that many of the problems associated with M-99 and similar narcotic compounds may be avoided by using a comparatively new compound, Sublimaze (McNeil Laboratories, Fort Washington, Pennsylvania 19034 USA). More information on this drug, also known as Fentanyl, is found in the two articles cited (Pienaar, 1968 a,b).

Allen (1970) reported that SCC could be used more effectively on white-tailed deer if an absorption-promoting enzyme, Hyaluronidase (Nutritional Biochemical Corp., Cleveland, Ohio, 44100 USA) were added. Van Niekerk et al. (1963) also used hyaluronidase to aid absorption of the drug Quiloflex. Hyaluronidase also can be used effectively with other drugs to make them work faster and sometimes longer. A dosage of 10 mg of hyaluronidase for each 50 to 100 kg of body weight is adequate, so no more than 20 mg is needed except for very large mammals.

Drugging and Handling Procedures

The usual method of injecting drugs from a distance of up to 100 meters is by use of a specialized weapon that fires a special syringe. The Palmer "Cap Chur" rifle and pistol are standard types used (Palmer Chemical and Equipment Co., Inc., Douglasville, Georgia, 30133 USA). Palmer has rifles that operate on CO_2 or powder (.22 caliber) charges. Pistols are effective at close range and are CO_2 powered. The powder charge rifle is preferred for most work particularly in temperate climates or where drugging is attempted at distances of 20 or more meters. Information on the purchase, use, and maintenance of the capture equipment is available from Palmer. A special projectile-type syringe is used with the rifle or pistol. Various sizes, needle types, and powder charges are available.

The syringes are fired from special guns powered by compressed gas or gunpowder cartridges. They also may be shot from crossbows or long bows, or attached to hand-held prods. Photo: Lee Perry

Alternatives to the Palmer equipment are also available. Ratti and Zeep (1972) used the Dist-Injekt Firearm (Firma P. Ott, 4106 Therwil, Switzerland) to their satisfaction. Many biologists, wardens, and conservation officers have had local gunsmiths insert a sleeve into 20, 16, or 12 guage shotgun barrels so that standard projectile syringes can be fired using a .22 caliber adapter. A new type of projectile-syringe system has been developed by Quinn Zoological Associates (8693 Wilshire Blvd, Beverly Hills, California 90211 USA) that claims to reduce the amount of impact or force of a projected syringe to that comparable to a hand injection. More information on this system can be obtained from Quinn Associates.

It is not always necessary or desirable to fire a syringe into an animal to inject a drug. Prod- or jab-type poles with a syringe device mounted on the end are useful for injecting drugs into animals held or confined in small areas or which are wounded, sick, or injured. A commercial prod-syringe is available from Pneu-Dart Inc. I use a prod-syringe of another design, not commercially available, but easily made by a machinist or even in many automobile repair shops. The prod I use utilizes the same aluminum tubes, plungers, and needles used by Palmer capturing weapons. I can provide plans for this prod upon request.

Another device that I found useful in handling small and medium sized animals is the pole produced by Ketch-All Company

TABLE 2. XYLAZINE DOSAGES FOR SEVERAL SPECIES OF ANIMALS.

Species or Group	Scientific Name	Dosage[1]	Source
Roe Deer	*Capreolus capreolus*	1.5-3	Bauditz, 1972
White-tailed Deer	*Odocoileus virginianus*	3-4	" "
Fallow Deer	*Dama dama*	5-8	" "
Red Deer	*Cervus elaphus*	3-4	" "
Moose	*Alces alces*	1.5	" "
Domestic cattle	*Bos taurus*	0.8-1.5	Stewart, 1972
Tragelaphine		1.5-3	Hime and Jones, 1970
European Mufflon	*Ovis ammon musimon*	3-6	Bauditz, 1972
Domestic sheep	*Ovis ammon aries*	0.3-0.6	" "
Tylopoda (camels, dromedarys, lamas)		1-2	" "
Domestic dog	*Canis lupus familiaris*	2-3	" "
Felidae (wild)[2]		8-10	" "
Domestic cat	*Felis silvestris domestica*	3-4	" "
Equidae (Sedation only)[3]		3-5	" "
Simiae (monkeys, apes, baboons, chimpanzees)		2-5	" "

[1]Given in mg/kg of the active ingredient

[2]For large cats, xylazine is often used in combination with ketamine hydrochloride and phencyclydine hydrochloride

[3]There are special problems in the use of xylazine on zebra species

Immobilized animals should be handled little and with great care. Ruminants should be placed on their sternums, if possible. Photo: Bill Cross, Maine Department of Inland Fisheries and Wildlife

(2537 University Ave., San Diego, California 92104 USA). This pole has a retractable metal loop on it and is built to protect the handler and the animal. I use the pole to transfer animals from cages or to restrain partially sedated animals or the young of a captured female.

Some points to keep in mind while immobilizing wildlife:

1. Practice loading and firing syringes with dummy loads equivalent to those used in the field; become proficient before going into the field.
2. Keep all equipment clean and in good repair, boil syringes and needles after every use making certain that the needle is not plugged.
3. Inform yourself and all those involved in the operation on the characteristics of the drug and equipment you plan to use.
4. Take your time in shooting the syringe; don't take a bad shot; aim for the heavy muscle mass of the hind quarters or neck.
5. Use barbed darts for most species to assure the dosage is injected and avoid second or third shots; treat the dart wounds with a disinfectant, sulfur powder and/or antiseptic ointment.
6. Approach a downed animal quietly, from downwind, and from the rear.
7. To avoid stress caused by handling, keep noise and movement to an absolute minimum.
8. Place animal on its sternum if possible: lay a ruminant on its right side if it can't be kept on its sternum.
9. Watch for and be prepared to treat bloating or respiratory failure.
10. Have all equipment ready and in one place before the animal is shot.
11. Handle wild animals no more than required to meet the objectives of the immobilization.
12. Keep current on new techniques, drugs, and equipment; update your methods as innovations become proven.

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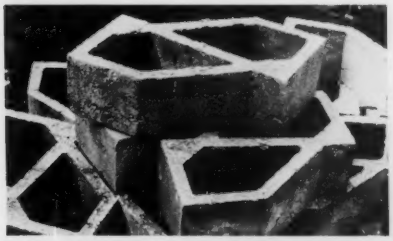
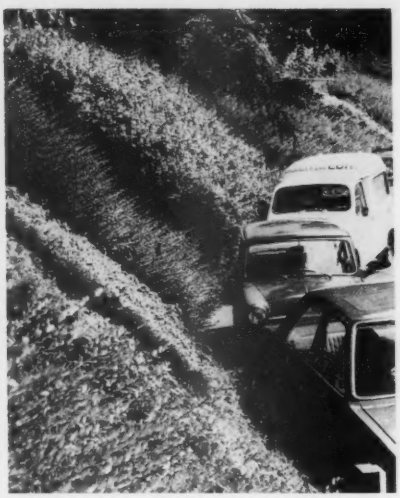
Stabilizing Slopes

Precast interlocking concrete blocks are commonly used for temporary paving and to stabilize sloping banks, particularly in locations where lack of moisture and restricted sunlight discourage the growth of plant material.

Open-centered interlocking blocks offer an additional advantage by providing stable or protected pockets of soil where plants can take root.

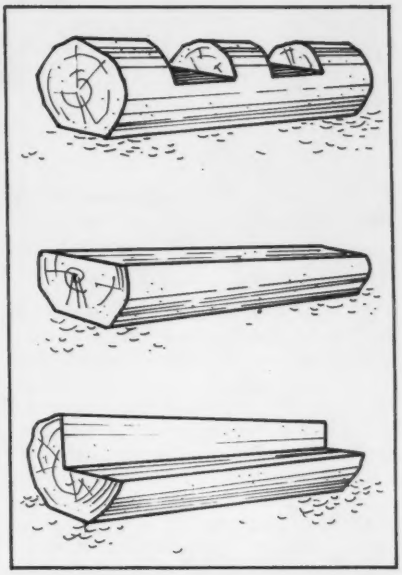
These precast blocks stabilize steep slopes around the main entrance driveway at the World Health Organization headquarters in Geneva, Switzerland. They were supplied locally. Photos: WHO





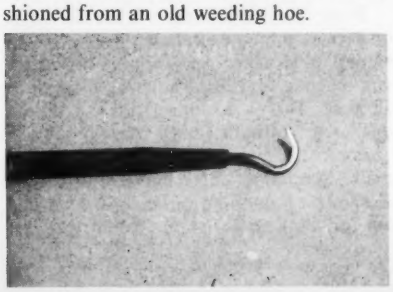
Log Benches

Fallen trees of suitable size can be turned into rustic benches for use along trails or in picnic areas. A cross-cut saw, ax and/or adz are the only tools required. These ideas came from Gretchen Shaw, Rock Creek Nature Center in Washington, D.C.



Weed Hook

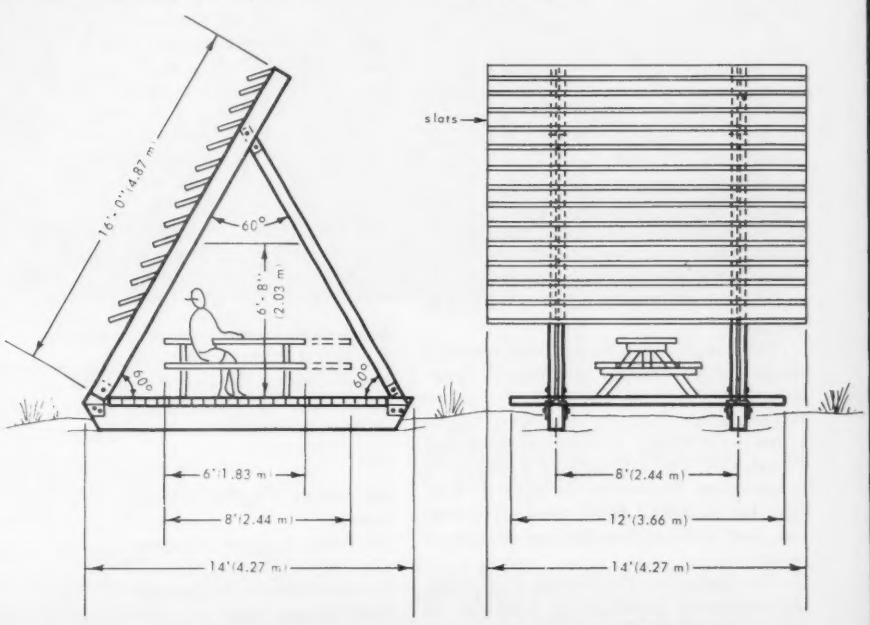
A simple hook can be used to clean grass, weeds and debris from cracks or joints in sidewalks and curbs. This hook was fashioned from an old weeding hoe.



Movable Picnic Shelter

On beaches or picnic areas where natural shade is lacking or inadequate a movable shelter is a welcome amenity.

This design, by Dick Kusek of the U.S. National Park Service, could be built with a variety of inexpensive materials. Its two hefty runners make it easy to turn or drag to a new location. Basic dimensions could be varied, of course.



BOOKS & NOTICES

Planning Interpretive Programmes in National Parks, 1976, Food and Agriculture Organization of the United Nations, Rome, Italy, 22 p.

The Forestry Department of the Food and Agriculture Organization of the United Nations has recently published a manual for *Planning Interpretive Programmes in National Parks*. The original Spanish version of the manual was prepared by Paul Spangle and Allen Putney. A French version is also available.

The manual's purpose is to outline a methodology for planning and implementing interpretive, informational and educational programs related to national parks. "Interpretive programmes" includes the combined concepts of information, interpretation and environmental education. Interpretive planning is emphasized as an integral part of overall park planning. Effective public communication is recognized as a means for potential achievement of a variety of management objectives.

A description of the "Park Interpretive Plan" is given and its relationship to the "Master Plan" is stressed. Steps for preparation of the interpretive plan are listed, along with such topics as "Background Information" and "The Interpretive Media." The latter covers personal services interpretation, audiovisual programs, exhibits, self-guiding devices, publications, off-site activities, and environmental education programs. Advantages and limitations of each interpretive media are effectively presented. The thematic approach for relating the park story as a conceptual whole is emphasized. Annotated examples of interpretive program plans for national parks in Chile, Costa Rica, Ecuador, and Turkey are included.

The manual fills an important need for basic interpretive planning in developing countries whose national parks and other wildland resources offer great potential for interpretive services. Interpreters, in general, will find the manual of great value in developing their own interpretive programs and in recognizing that interpretation of natural and cultural resources knows no international boundaries.

Copies may be obtained from: Food and Agriculture Organization of the United Nations, Via delle Termi de Caracalla, 00100, Rome, Italy.

—Richard L. Cunningham

8th World Forestry Congress, Jakarta, 16-28 October 1978

The Food and Agriculture Organization of the United Nations (FAO), in cooperation with the Director-General of Forestry of Indonesia, have announced plans for convening this important Congress in Jakarta, Indonesia. Its general theme is "Forests for People." This Congress is concerned primarily with administration and management of forests for commercial use; however, much of interest to managers of forested national parks and reserves will be discussed.

The Congress will be organized around 5 major plenary sessions at which 30 "position papers" will be discussed. The provisional agenda lists the following topics: Forestry for Rural Communities (4 papers), Forestry for Food (6 papers), Forestry for Employment Promotion (5 papers), Forestry for Industrial Development (10 papers), and Forestry for Quality of Life (5 papers).

The Indonesia Organizing Committee has requested participating countries to submit "country reports" of a comprehensive nature on the extent, accomplishments and objectives of their respective forestry programs. These are to be available to those selected to prepare the position papers. In addition, "voluntary papers" are invited on subjects related to the main agenda topics and the position papers for possible inclusion in the Congress documentation. The organizers are particularly eager to draw wide attention to the opportunity for individuals to submit these papers, preferably before 31 December 1977.

For more detailed information on the agenda, titles of the position papers, the availability of study tours before and after the Congress and other matters contact:

Mr. Lukito Daryadi, Secretary-General
8th World Forestry Congress
c/o Direktorat Jenderal Kehutanan
Jalan Salemba Raya 16
Jakarta, Indonesia

or

Mr. Oscar Fugalli, Associate Secretary-General
8th World Forestry Congress
c/o Forestry Department of FAO
Via delle Terme di Caracalla
00100 Rome, Italy

Notice to Subscribers

The editors often receive requests for back issues of PARKS magazine. We regret that almost all issues of Volume 1 in English are out of print, as are several back issues in French and Spanish.

However, we are pleased to announce that all issues in English are now available on microfilm. They may be ordered from University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan 28106/USA. Microfilm editions in Spanish and French may also be made available if the demand for them is high enough.

Since the beginning of the PARKS magazine pilot project we have, fortunately, been able to distribute all copies sent outside of North America by official air post. This is no longer possible. From this issue onward, until further notice, normal distribution will be by surface mail. Special arrangements for alternate methods of distribution may be worked out for some areas or some countries.

Great egrets in the trees at Stone Harbor Bird Sanctuary. Photo: Marion Glaspey

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